Community effects on the risk of HIV infection in rural Tanzania

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Community effects on the risk of HIV infection in rural Tanzania

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Abstract

Objectives: To investigate the effect of community characteristics on HIV prevalence and incidence.

Methods: Data from an open cohort study with demographic surveillance, epidemiological surveys and qualitative research were used to examine the relationship between individual and community risk factors with HIV prevalence in 1994/95 and incidence between 1994/95 and 1996/97 among men (n=2271) and women (n=2752) living in a rural area in northwest Tanzania. Using subvillages as the unit of analysis, community factors investigated were level of social and economic activity, ratio of bar workers per male population aged 18-59, level of community mobility, and distance to the nearest town. Logistic and Cox regression models were estimated to assess community effects, controlling for multiple individual factors.

Results: All four community factors had strong effects on HIV transmission. Men who lived in subvillages with the highest level of social and economic activity had an odds of being HIV positive that was about five times higher (OR=4.71, 95% CI=2.89-6.71) than those in places with low levels of activity; women in these subvillages had an odds that was twice as high (OR=1.92, 95% CI=1.27-2.92). After controlling for community effects, the effects of some individual factors on the risk of HIV—education, male circumcision, type of work, and number of household assets—changed notably. The association between HIV incidence and community factors was in the expected direction, but did not reach statistical significance (RR=2.07, p=0.10).

Conclusions: Results suggest that community characteristics play an important role in the spread of HIV in rural Tanzania. Community effects need to both be considered in individual risk factor analyses and given more attention in intervention programs.

Keywords: HIV, Tanzania, community effects, prevalence, incidence

INTRODUCTION

Research on the risk of HIV in developing countries has focused primarily on factors pertaining to individuals that increase the likelihood of infection. These factors, now well documented, relate to biological conditions, socio-demographic groupings, and patterns of sexual behavior (1). Yet, these individual variables explain only a small part of the variation in the risk of HIV. Recently, attention has been directed towards wider environmental characteristics, such as the nature of residential communities, that may mediate the effect of these individual factors (2). Since the late 1980s, higher levels of HIV seroprevalence in urban versus rural areas emerged as a predominant pattern in developing countries, at least in the initial stages of the epidemic (3). This urban-rural pattern has persisted in East Africa as well (4;5). A similar differential has been observed within exclusively rural areas of East Africa: higher rates of HIV have been detected among residents of villages proximate to roads and trading centers when compared with people living in places more remote from these centers of social and economic activity (6-10).

This study investigates the impact of four community attributes—level of social/economic activity, availability of bar workers, population mobility and distance to the nearest town—on the risk of HIV infection in Kisesa, a rural ward in the Mwanza region of northern Tanzania. The relationship of these factors with the prevalence and incidence of HIV is studied. Further, the indirect influence of community factors on HIV infection is assessed by examining the change in the relationship of individual risk factors to the likelihood of HIV, after taking these community factors into account.

DATA AND METHODS

Kisesa ward has a population of about 20,000 and is located along the main road to Kenya. The area is 20 kilometers east of Mwanza, the regional capital and second largest city in Tanzania (estimated population 250,000). Kisesa ward is comprised of six villages, divided into 47 subvillages, which are the smallest administrative unit of the government (‘kitongoji’). The ward includes a trading center (also called

Kisesa) located on the main road which goes from Mwanza to Kenya. The population of these subvillages ranges from 58 people in the more rural areas to 461 in the trading center.

Data for the present study come from three sources. Economic status, based on the number of household assets, was derived from the 1994 census of all households in the ward. HIV status, socio-demographic data, information on sexual behavior, male circumcision, the number of injections obtained during the last year, and the presence of genital ulcer or discharge in the last year were taken from two surveys of all adults living in Kisesa, conducted in 1994/95 and in 1996/97. Using the most recent demographic surveillance lists, all adults aged 15-44 were asked to come to a central point in the village for an interview and to give a blood sample for HIV testing for each survey. HIV incidence was based on the number of seroconverters between the two surveys. Informed consent was obtained and study participants were offered free medical treatment for health problems. HIV counseling and testing were offered in the second survey. Information about communities, regarding the number of bar workers, bars, and women available for commercial sex, was collected using qualitative methods. The surveillance system, surveys and qualitative research are explained in further detail elsewhere (9).

Individual and community factors

Analyses focused on individual and community factors associated with the prevalence of HIV in 1994/95, and with HIV incidence occurring between 1994/95 and 1996/97. Community characteristics were based on four different attributes that pertained to the 47 subvillages of Kisesa ward. These were type of subvillage with regard to social and economic activity, the ratio of bar workers to males aged 18-59, mobility of the subvillage population, and the distance to the nearest town (Mwanza). Subvillages were classified by the level of social and economic activity that took place relative to other subvillages in the area, based on: the presence of a main or secondary road, frequency of public transport, number of shops, bars, schools, health facilities, and volume and frequency of trade. From the most active to the least, the groups were classified as the trading center, peri-trading center, rural small and rural sparse; for the incidence analyses, the latter two groups were combined due to the small number of seroconverters in each. Four geographically contiguous subvillages comprised the trading center, which was located along the main road. The six peri-trading center subvillages were those closest to the trading center. Five subvillages classified as rural small were interspersed throughout the ward's remaining 32 rural sparse subvillages. The ratio of bar workers in each subvillage was derived by calculating the number of these women per male population aged 18-59 in each subvillage. Subvillages were grouped into low (0-2/100 males), moderate (3-5/100 males) or high (6-8/100 males) ratios. Subvillage mobility referred to the proportion of individuals who had lived in their current household for less than five years. and classified as low (<=10%), moderate (11-19%) and high (>=20%). The last factor pertained to the distance in kilometers between the subvillage and Mwanza, the nearest urban area. Subvillages at distances 11 km or greater were classified as far, those 5-10 km away as moderate, while those at less than 5 km as close. There was some overlap between the classification of subvillages in the respective levels of the four different indicators of community risk, but subvillages often fell into different levels across the factors as well. For example, two of six subvillages comprising the peri-trading center group fell into the low bar worker ratio category. Among the five rural small subvillages, one fell into the high bar worker ratio category, one into the moderate, and the remaining three in the low category.

Statistical Analyses

Descriptive analyses focused on the differentials in HIV prevalence based on individual and community-based factors, stratified by sex. Logistic regression was used to obtain age-adjusted odds ratios for being HIV positive in 1994/95. Four separate models were estimated to investigate the effect of the community factors on the likelihood of being HIV positive in 1994/95, since multicollinearity precluded the use of the community factors together in one model. Baseline models controlled for individual factors known to influence the likelihood of HIV infection, including age, marital status, education, type of work, individual mobility, number of household assets, male circumcision, the number of sexual partners and injections during the past year, and the presence of a genital ulcer or discharge during the last year.

Incidence analyses combined men with women due to the small number of seroconverters in the sample. Cox regression models were estimated to assess community effects on the probability HIV seroconversion between 1994/95 and 1996/97, controlling for sex, age, and marital status. The seroconversion date was assumed to be the midpoint between the two interview dates of each individual. All statistical tests presented are based on robust estimates of variance.

RESULTS

Table 1 shows HIV prevalence by individual risk factors along with age-adjusted odds ratios. Overall, HIV prevalence in 1994/95 was higher among women than among men. The odds of being HIV positive in 1994/95 were significantly higher for men in the oldest three age groups (OR=3.76, 95% CI=1.76-8.02, OR=4.80, 95% CI=2.75-8.36, OR=5.43, 95% CI=3.08-9.57, respectively). When adjusting for age, several other factors demonstrated statistically significant associations with the likelihood of being HIV positive. Formerly married (widowed, divorced or separated) men were more likely to be HIV positive, as were men with higher education, those working as traders or professionals, those with three or more sexual partners during the last year, those with highest household assets, and those with at least five injections. Being circumcised, individual mobility and a genital ulcer or discharge during the last year did not demonstrate statistically significant associations with HIV prevalence among men.

Results for women were similar. Women in the older four age groups had a significantly greater odds of being HIV positive, with women aged 15-29 (OR=6.71, 95% CI=2.90-15.51) and those aged 30-34 (OR=5.50, 95% CI=2.50-12.07) being at highest risk. Adjusting for age, women most likely to be HIV positive were those who were formerly married, highly educated, living in households with greater assets, those who reported a genital ulcer, discharge or more than five injections during the last year, those who worked as traders or professionals and those who reported two or more sexual partners during the past year. Individual mobility did not reach statistical significance when adjusting for age.

Table 2 presents the community-level effects on HIV prevalence among men and women in Kisesa in 1994/95. A clear association was detected between higher levels of HIV prevalence and increased levels of community risk as measured in all four contexts, among both men and women. Among men, the largest differences in prevalence were observed for the level of social and economic activity within the subvillage. Equivalent differences were detected among women living in the trading center and rural sparse villages, as well as those in subvillages with high and low mobility.

The adjusted odds ratios in Table 2 are from logistic regression models that controlled for the individual factors included in Table 1. Adjusting odds ratios in such a manner allows for an assessment of the magnitude of the community effects which is independent of individual factors. All four community risk factors demonstrated strong, significant relationships with HIV prevalence among both men and women. Little change observed between the crude and adjusted odds ratios for men. The magnitude of community effects for women decreased, but remained statistically significant. Men living in trading center subvillages had an estimated odds of being HIV positive that was nearly five times higher than those in rural sparse subvillages. Significantly higher odds of being HIV positive were also observed for men living in subvillages where the ratio of bar workers was higher, those living in locales where the population was the most mobile and those living in closer proximity to Mwanza. The impact of these community factors on HIV infection was somewhat less among women, but were otherwise similar.

When controlling for community characteristics, the age-adjusted individual factors for education, type of work, household assets and male circumcision demonstrated changes in the likelihood of being HIV positive. Among men, the effects of education, type of work and household assets were attenuated and lost statistical significance, while the protective effect of male circumcision was more and marginally significant (OR=0.66, 95% CI=0.44-0.99). Among women, the impact of the number of household assets was attenuated.

Community effects on HIV Incidence

The models investigating community effects on HIV incidence are presented in Table 3. Being male or female did not demonstrate a significant relationship with HIV incidence in the multivariate models, even though incidence was higher among women than men (0.84 per 100 person years, 0.73 per 100 person years, respectively). Overall F-tests were conducted for the groups of variables for age, marital status and community level characteristics in these models. The associated p-values from the test statistics were equivalent for age and marital status in all four models. The strongest risk factor for seroconversion was marital status; those formerly married had a risk of infection over four times that for those never married ($p<0.001$ in all four models). Age also influenced the risk of infection (p-values ranged from 0.02-0.03). Higher levels of community risk in the four different contexts were associated with a higher risk of seroconversion among individuals, but these relationships did not reach statistical significance in these models. In the case of subvillage mobility, statistical significance was marginal (HR=2.24, $p=0.09$). However, the direction of all these effects is clear: as community risk for HIV infection increases, so does individual risk.

The effect of individual condom use on prevalence and incidence

Condom use in Kisesa is very low, with only 9% of men and 0.9% of women reporting any use during the previous year in the 1994-1995 survey. The vast majority of people reporting condom use during the last year also reported multiple partners during the same period (72% of men, 96% of women). Reported condom use in Kisesa can thus be viewed as a proxy for multiple partnerships, as condom use within marriage is very rare. Condom use among women had little effect on prevalence. Among males, condom use was associated with a statistically significant higher probability of being HIV positive in 1994-1995 in all four models. Similar results were observed in the incidence models, with hazard ratios of 2.3 in the four different models (p-values ranged from 0.13-0.17). These results concur with other studies in the region (5;11).

DISCUSSION

This study in a small rural area of Tanzania suggests that community characteristics play an important role in the spread of HIV. People living in the small trading center had much higher prevalence and incidence than those in nearby rural villages and there was a gradient in HIV prevalence by level of socio-economic activity. In the incidence models, these factors did not reach statistical significance, but the odds of infection based on the highest levels of these factors was considerable. Since there were only 60 seroconverters in the sample, statistical power was limited. In the prevalence analyses, where the sample of cases was much larger (134 men and 201 women), these effects were highly significant.

In general, the strong association between type of community and HIV could not be explained by differences in individual risk factors, including self-reported sexual behavior. This has also been observed in other studies in nearby regions of Africa, where higher levels of infection were detected relative to the proximity of main roads (6;10). These studies indicate that community differences in the spread of HIV persist in the early and more mature stages of the epidemic, although it cannot be excluded that difference in prevalence between communities in our study will reduce somewhat when the epidemic matures. The Kisesa study is, however, unique because it demonstrates the existence of such large HIV transmission differentials in a study of a geographically contiguous population.

Place of residence, classified into trading center, peri-trading center, rural villages and rural sparse in our study, is likely to be a proxy for socio-economic activity. In the communities with higher levels of socio-economic activity it may be more likely to meet a new sexual partner, who may come from elsewhere (higher mobility, more bar workers) and bring in a primary infection. The latter is thought to play a key role in the spread of HIV (12). Using the 47 subvillages as the level of analysis, communities were classified according to ratio of female bar workers to males, overall level of population mobility, and distance to the regional capital. In separate statistical models, the three community variables were positively associated with the prevalence of HIV infection among men and women. Communities that had high concentrations of social and economic activity also had high levels of two of the other characteristics—ratio of bar workers to the male population and population mobility. A sample covering a more expansive and varied area may allow further investigation of these and other community effects. Of particular interest would be examining whether or not specific characteristics are associated with higher rates of HIV infection, or whether groups of characteristics tend to cluster in communities. The data presented here suggests the latter.

The factor based on a count of bar workers per male population may be problematic. “Bar worker” is a broad characterization of women who may have markedly different lifestyles with respect to male partners. In a neighboring town, it was observed that the majority of these women have sexual relationships based on some type of exchange, but the number and type of partners varied from few regular to many casual (13). This makes it difficult to assess a correlation of community risk based on the number of bar workers alone. More information about the type and number of partners might create a more robust measure. For example, if the majority of bar workers in more remote places have less casual partners than those living in the trading center, a smaller number of bar workers in the trading center may account for many more acts of casual sex than a larger number of such women in rural sparse areas.

The factor indicating distance to the nearest town, Mwanza, exhibited a similar relationship to the risk of HIV infection. The basis of the risk of proximity lies in the probability of mixing with partners from an area of higher HIV prevalence; Mwanza town does not appear to have much higher prevalence than Kisesa trading center (11). A sexual mixing survey indicated that 2% of men and 8% of women living in the trading center had partnerships in the last year in the town (14). Within Kisesa ward, 2% of men and 7% of women in the rural villages reported partners in the trading center, but rarely in Mwanza town. Similar levels of sexual mixing between urban, town and rural areas was also observed in nearby Uganda (15). Whether such levels of sexual mixing would increase HIV prevalence can only be assessed through modeling with more complete sexual network data.

Findings relating to the individual factors associated with the risk of HIV in the prevalence and incidence analyses are similar to that of other studies in the region (4;8;10;16-18). Among men, no distinct trend in mobility was detected. This contrasts sharply with mobility on the community level, which exerted a strong impact on the likelihood of HIV infection. The relationships between some individual factors and the likelihood of being infected with HIV changed when taking community factors into account. Most notable was the protective effect of circumcision in the male models, which became more pronounced and significant. Controlling for individual risk factors had little effect on the association between the risk of HIV and place of residence among men. A possible explanation is that men in the trading center are considerably more exposed to the risk of HIV than their rural counterparts through contacts with infected bar workers or other women inside or outside the trading center. Among women, a reduction of the effect of residence on risk of HIV infection occurred, although a significant effect remained. This suggests that some of the excess risk in the trading center is due to having relatively more divorced or separated women and more women with at least some education compared with the rural villages.

Thus far, AIDS prevention campaigns in sub-Saharan Africa have focused on promoting knowledge and behavior change in the general population, or targeting certain groups. Emerging evidence after a decade of such interventions shows that while knowledge has markedly increased, changes in behavior have been less dramatic, and condom use is still very low (19). In resource-constrained settings there is a need to focus interventions on populations with the highest levels of transmission. Understanding what community characteristics are associated the risk of HIV will help to appropriately target interventions towards places with elevated risks and where there is an increased acquisition rate of new partners. The criteria for selection of areas may vary from place to place but generally include level of socio-economic activity and mobility, infrastructure and extent to which the population is linked with higher prevalence populations, presence of commercial sex and alcohol selling establishments. A methodology has been developed to identify places with high rates of new partner acquisition as high transmission areas, such as Kisesa trading center (20).

To conclude, our analyses show a strong and consistent effect of community characteristics on the risk of HIV which cannot be explained by individual risk factors. The risk of HIV infection varies, depending on where people live. Higher levels of socio-economic activity, the presence of bar workers, and high levels of mobility all contributed to increased risks that are not captured by individual factors. Changes observed in the relationship of individual factors to the likelihood of being infected with HIV demonstrates the importance of taking community effects into account in investigations focusing on the risk of HIV infection.

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Contributors

MU, JZL, RI and JTB designed and implemented the study, including data management. SSB carried out the analysis for this paper and in collaboration with other co-authors interpreted the results; SSB drafted the manuscript, which was commented on and revised by all co-authors.

Conflict of interest: None

Table 1. HIV seroprevalence among men and women by individual characteristics, with age-adjusted odds ratios, Kisesa, 1994-1995.

	Men			Women		
	No. assessed	Percent Sero-positive	Age-adjusted OR (95% CI)	No. assessed	Percent Sero-positive	Age-adjusted OR (95% CI)
Total	2271	5.9		2752	7.5	
Age (years)						
14-19	439	2.1		429	1.9	
20-24	535	1.7		670	7.6	
25-29	411	7.3		575	11.3	
30-34	416	9.1		518	9.5	
≥ 35	470	10.2		560	5.8	
Marital Status						
Never married	920	2.8	1.00	408	6.1	1.00
Monogamous	1128	6.9	0.95 (0.54-1.66)	1641	6.2	0.61 (0.38-0.99)
Polygamous	114	7.9	0.97 (0.47-1.98)	454	7.9	0.78 (0.44-1.32)
Widow/divorced/separated	109	19.3	2.99 (1.36-6.56)	249	17.7	1.97 (1.10-3.50)
Education						
None	329	4.3	1.00	863	3.8	1.00
Primary	1820	5.9	1.93 (1.07-3.45)	1830	9.0	2.67 (1.84-3.86)
Secondary	122	9.8	3.00 (1.26-7.17)	59	15.3	4.83 (2.74-8.51)
Type of work						
Farmer/student	1715	4.6	1.00	2476	6.6	1.00
Professional/trader/manual laborer	556	9.9	1.93 (1.25-2.99)	276	15.6	2.43 (1.74-3.38)
Mobility (years in household)						
≥ 15 years	1801	5.4	1.00	1852	6.9	1.00
6-14 years	223	9.4	1.52 (0.79-2.93)	410	7.8	0.98 (0.70-1.37)
2-5 years	166	8.4	1.58 (1.00-2.51)	340	9.4	1.23 (0.86-1.76)
< 2 years	81	2.5	0.47 (0.11-2.06)	150	10.0	1.49 (0.94-2.35)
Number of household assets						
0	762	4.7	1.00	930	5.6	1.00
1-3	608	6.6	1.50 (0.91-2.45)	731	6.3	1.14 (0.72-1.78)
4-8	730	5.5	1.21 (0.64-2.27)	835	8.3	1.51 (0.92-2.50)
9+	146	11.0	2.59 (1.47-4.54)	216	15.7	3.06 (2.03-4.61)
Number of sexual partners in past year						
< 3 (men) < 2 (women)	1537	4.9	1.00	2440	6.6	1.00

≥ 3 (men) ≥ 2 (women)	734	7.9	1.95 (1.53-2.48)	312	14.2	2.69 (1.61-3.37)
Male circumcised						
No	1697	5.7	1.00			
Yes	574	6.5	0.97 (0.68-1.40)			
Number of injections in past year						
< 5	1898	4.6	1.00	2187	6.6	1.00
≥ 5	373	12.6	3.01 (2.12-4.26)	565	11.0	1.76 (1.48-2.08)
Genital ulcer or discharge in the past year						
No	2060	5.7	1.00	2650	7.2	1.00
Yes	211	7.6	1.45 (0.78-2.69)	102	15.7	2.23 (1.24-4.02)

Table 2. Level of HIV seroprevalence as a function of living in places with various levels of community risk by sex, with crude and adjusted odds ratios from logistic regression models[1] of the likelihood of being HIV positive, Kisesa, 1994-1995.

	Men (n=2271)				Women (n=2752)			
	Number assessed	Percent Sero-positive	Crude OR (95% CI)	Adjusted OR (95% CI)	Number assessed	Percent Sero-positive	Crude OR (95% CI)	Adjusted OR (95% CI)
Type of subvillage re: social/economic activity								
Rural sparse	1289	3.5	1.00	1.00	1447	4.8	1.00	1.00
Rural small	307	4.6	1.32 (0.56-3.11)	1.45 (0.52-4.04)	333	6.6	1.41 (0.88-2.27)	1.17 (0.70-1.95)
Peri-trading center	311	8.0	2.42 (1.49-3.91)	2.18 (1.23-3.84)	373	9.1	2.00 (1.33-3.03)	1.63 (1.04-2.42)
Trading center	364	13.7	4.40 (2.98-6.50)	4.71 (2.57-8.63)	599	13.5	3.12 (1.96-4.97)	1.92 (1.06-3.48)
Ratio of bar workers in subvillage to total male population (18-59) of Kisesa ward								
Low (0-2/100 males)	1384	3.6	1.00	1.00	1552	5.1	1.00	1.00
Moderate (3-5/100 males)	415	7.7	2.23 (1.43-3.48)	2.05 (1.20-3.52)	479	8.6	1.74 (1.21-2.52)	1.67 (1.21-2.28)
High (6-8/100 males)	472	11.0	3.30 (1.78-6.14)	2.95 (1.31-6.67)	721	11.9	2.53 (1.45-4.40)	1.59 (0.85-2.94)
Mobility of subvillage population: proportion of people in current household < 5 years								
Low (< 10%)	838	3.6	1.00	1.00	950	4.8	1.00	1.00
Moderate (11-19%)	1061	5.8	1.64 (0.88-3.07)	1.55 (0.82-2.95)	1206	6.6	1.38 (0.92-2.07)	1.27 (0.86-1.87)
High (≥ 20%)	372	11.6	3.52 (2.13-5.82)	3.17 (1.63-6.17)	596	13.6	3.09 (1.88-5.08)	1.95 (1.07-3.55)
Distance to the nearest town (Mwanza)								
Far (≥ 11 km)	1240	3.4	1.00	1.00	1393	5.0	1.00	1.00
Moderate (5-10 km)	566	7.6	2.35 (1.21-4.52)	2.18 (1.15-4.15)	677	8.7	1.83 (1.23-2.74)	1.52 (1.07-2.19)
Close (< 5 km)	465	10.5	3.36 (2.06-5.47)	2.85 (1.57-5.17)	682	11.4	2.48 (1.37-4.45)	1.68 (1.00-2.84)

[1] The models adjust for all the individual factors shown in Table 1. Each of the community factors are modeled separately, due to multicollenearity.

**Table 3. Cox regression models examining the risk of HIV seroconversion associated with living in communities with various levels of risk characteristics,
Kisesa, 1996-1997 (n=3808).**

	Model A		Model B		Model C		Model D	
	Risk Ratio	p-value	Risk Ratio	p-value	Risk Ratio	p-value	Risk Ratio	p-value
Sex								
Female	1.00	-	1.00	-	1.00	-	1.00	-
Male	1.10	0.7	1.04	0.9	1.08	0.8	1.05	0.8
Age (years)								
14-19	1.00	-	1.00	-	1.00	-	1.00	-
20-24	2.62	0.005	2.59	0.00	2.63	0.005	2.57	0.006
25-29	2.15	0.07	2.23	0.06	2.17	0.06	2.20	0.06
30-34	2.28	0.04	2.35	0.04	2.30	0.04	2.34	0.04
≥ 35	2.42	0.007	2.5	0.004	2.44	0.005	2.45	0.005
Marital status								
Never married	1.00	-	1.00	-	1.00	-	1.00	-
Monogamous	0.90	0.8	0.87	0.8	0.88	0.8	0.88	0.8
Polygamous	1.49	0.4	1.40	0.5	1.45	0.5	1.40	0.5
Widow/divorced/separated	4.23	0.006	4.04	0.008	4.12	0.007	4.14	0.007
Type of subvillage re: social/economic activity								
Rural sparse or rural small	1.00	-						
Peri trading center	1.26	0.6						
Trading center	2.07	0.1						
Ratio of bar workers in subvillage to total male population (18-59) of Kisesa ward								
Low			1.00	-				
Moderate			1.44	0.4				
High			1.62	0.4				
Mobility of subvillage population: proportion of people in current household < 5 years								
Low (< 10%)					1.00	-		
Moderate (11-19%)					1.27	0.5		
High (≥ 20%)					2.24	0.09		
Distance to the nearest town (Mwanza)								
Far (≥ 11 km)							1.00	-
Moderate (5-10 km)							1.47	0.3
Close (< 5 km)							1.78	0.2

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